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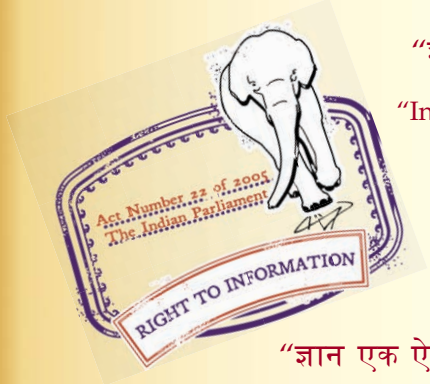
IS 6871 (1992): Wind Equipment - Distant Indicating [PGD 21: Meteorological Instruments]



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पवन दिशा उपस्कर — दूरी सूचक — विशिष्टि

(पहला पुनरीक्षण)

Indian Standard

WIND EQUIPMENT — DISTANT INDICATING — SPECIFICATION

(First Revision)

UDC 551·508·5

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

July 1992

Price Group 5

AMENDMENT NO. 1 MAY 1994
TO
IS 6871 : 1992 WIND EQUIPMENT — DISTANT INDICATING — SPECIFICATION

(First Revision)

(*Page* 1, *clause* **4.2**) — Add the following under column 'Material' and 'Components' at the end of the clause:

'c) Copper Conical cups'

(*Page* 2, *clause* **4.2.1**, *line* 2) — Delete the word 'or aluminium'.

[*Page* 2, *clause* **4.3** (a)] — Read 'Aluminium alloy' *for* 'Aluminimum'.

(LMD 21)

Reprography Unit, BIS, New Delhi, India

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Meteorological Instruments Sectional Committee had been approved by the Light Mechanical Engineering Division Council.

This standard was originally published in 1973. In this revision the following changes have been incorporated:

a) Use of magslip selsyn transmitting motor has been included.

b) Reference to Indian Standards for standard cabinet has been incorporated.

c) Wind speed in kmph has been added alongwith speed in knots.

The accurate measurement of wind speed and direction is of great importance in meteorological research and practice, as well as in aviation, agriculture, transport, shipping, engineering and in other fields. The simplest and most common method of measuring these two parameters near the ground is by the use of direct reading anemometers (*see* IS 5912 : 1970) and windvanes (*see* IS 5799 : 1970). Remote reading electrical anemometers and windvanes are also extensively used, particularly at aeronautical meteorological stations, for the measurement of wind speed and direction at distant locations.

Specifications for distant indicating electrical wind equipment in use at important meteorological stations in the country have been prepared by the India Meteorological Department. With the increasing use and manufacture in the country of such equipment, the formation of Indian Standard specification for distant indicating wind equipment has become necessary.

This standard has, therefore, been prepared in the interest of accuracy in the measurement of wind speed and direction, and of standardization in the manufacture of distant indicating wind equipment.

In the formulation of this standard, due consideration has been given to the requirements laid down by the World Meteorological Organization, Geneva in addition to special requirements obtaining in this country.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

WIND EQUIPMENT — DISTANT INDICATING — SPECIFICATION

(First Revision)

1 SCOPE

1.1 This standard specifies the requirements for distant indicating wind equipment consisting of an electrical anemometer, an electrical windvane, with remote reading wind speed and direction indicators.

2 REFERENCES

The following Indian Standards are necessary adjuncts to this standard:

IS No.	*Title*
2419 : 1979	Dimensions for panel mounted recording electrical instruments (*first revision*)
8754 : 1978	Electrical anemograph (*under revision*)
9606 : 1980	Dimensions for panels and racks (482·6 mm systems)

3 DESCRIPTION

3.1 The complete equipment consists of the electrical anemometer and windvane mounted on a supporting mast assembly and electrically connected by means of cables to the wind speed and direction indicators located at a distance from the wind sensors.

3.1.1 The anemometer is of the cup generator type and consists of a three cup rotor assembly which drives a multi-pole permanent magnet rotor inside a stator consisting of coils wound on a laminated core. The alternating current generated is rectified and measured on a dc voltmeter. The voltage is proportional to the wind speed which is directly read on the wind speed indicator.

3.1.2 The electrical windvane consists of a vane assembly with its spindle coupled to a transmitting motor in a weather-proof housing and the wind direction indicator containing a receiver motor, both transmitter and receiver having similar electrical components. The windvane is operated by a 24 volts dc supply from a transformer rectifier unit connected to 230 volts ac mains. The movements of the transmitter rotor followed by the receiver rotor are indicated by a pointer attached to the shaft of the receiving motor located in the wind indicator. The windvane can also be coupled to a magslip selsyn transmitting motor operated by secondary supply of maximum 110 V ac 50 Hz, from a transfer unit connected to 230 V ac 50 Hz main, with suitable wind indicating panel conforming to IS 8754.

3.1.3 The indicator unit consists of a metal cabinet on which are mounted the wind speed and wind direction indicators. A transformer-rectifier for 24 V dc transmitter, a transformer with a secondary supply of 50/110 V ac 50 Hz for synchro transmitter and two toggle switches in the front panel control the connection between the sensors and the indicators meters. A two-pin plug for the mains and an octal socket for the lead wires from the sensors are provided at the back of the cabinet.

NOTE — If standard cabinets are required IS 2419 : 1979 and IS 6909 : 1980 may be referred.

4 MATERIAL

4.1 The material, used for the fabrication of the field equipment shall be such that it may withstand permanent exposure in the open and have a long life extending over a number of years. Suitable materials for the various components of the equipment are suggested in **4.2** and **4.3** but the use of such material is not obligatory provided the alternative material satisfies the requirement given in **8.1**, **8.2** and **8.3**.

4.2 Cup Generator Anemometer

Material	*Components* (*see* Fig. 1)
a) Brass	Cup arms and fixing sockets, base casting, dust cover, main cover, pillar, spider, top bearing clamping ring and top casting, rainguard, top nut.
b) Gun metal	Main shaft and rotor adjusting sleeve

4.2.1 The material used for the fabrication of the cups shall be copper or aluminium sheets of 0·71 mm thickness.

4.3 Windvane

Material	*Components (see* Fig. 2)
a) Aluminium	Arm support, horizontal arm, dust cover, fin support housing, spindle bearing support, terminal block plate and transmitter support
b) Aluminium alloy	Fin and bearing housing cup
c) Brass	Cap nut, flexible coupling, mounting plate, spindle and split bars
d) Galvanized steel	Balance weight, cover and direction letter
e) Mild steel	Direction arm, locking pin and guide pin

5 DIMENSIONS

5.1 The general arrangement, nomenclature and dimensions of the cup generator anemometer shall be as shown in Fig. 1.

5.2 The general arrangement, nomenclature and dimensions of the electrical windvane shall be as shown in Fig. 2.

6 GENERAL REQUIREMENTS

6.1 Cup Generator Anemometer

6.1.1 Each of the three rotor cups shall have an internal diameter of exactly 127·0 mm and be semiconical in shape with beaded edges. Any alteration in the shape or dimensions of the cup and the cup arm is likely to result in a departure from the desired ratio between the cup rotor revolution and true wind speed.

6.1.2 The generator housing shall be weatherproof. A one metre length of twin core PVC sheathed cable shall be provided, one end of which shall be connected to the terminals of the generator in such a way that no short-circuiting (due to moisture or any other cause) may occur while at the same time, inspection of the mechanism is possible without detaching the cable.

6.1.3 The main shaft shall rotate in two ball bearings, one at the top and the other at the bottom. The bearings shall be adequately enclosed lubricated and protected from dust and moisture.

6.1.4 The rotor shall be permanent multipole magnet, fully magnetized, and fixed to the main shaft through an adjusting sleeve to facilitate correct adjustment of the position of the rotor.

6.1.5 The stator stampings shall be riveted together within two end plates of mild steel. The coils shall be wound over their projections and connected in series. The complete stator with coils shall be mounted securely on the base casting on three pillars.

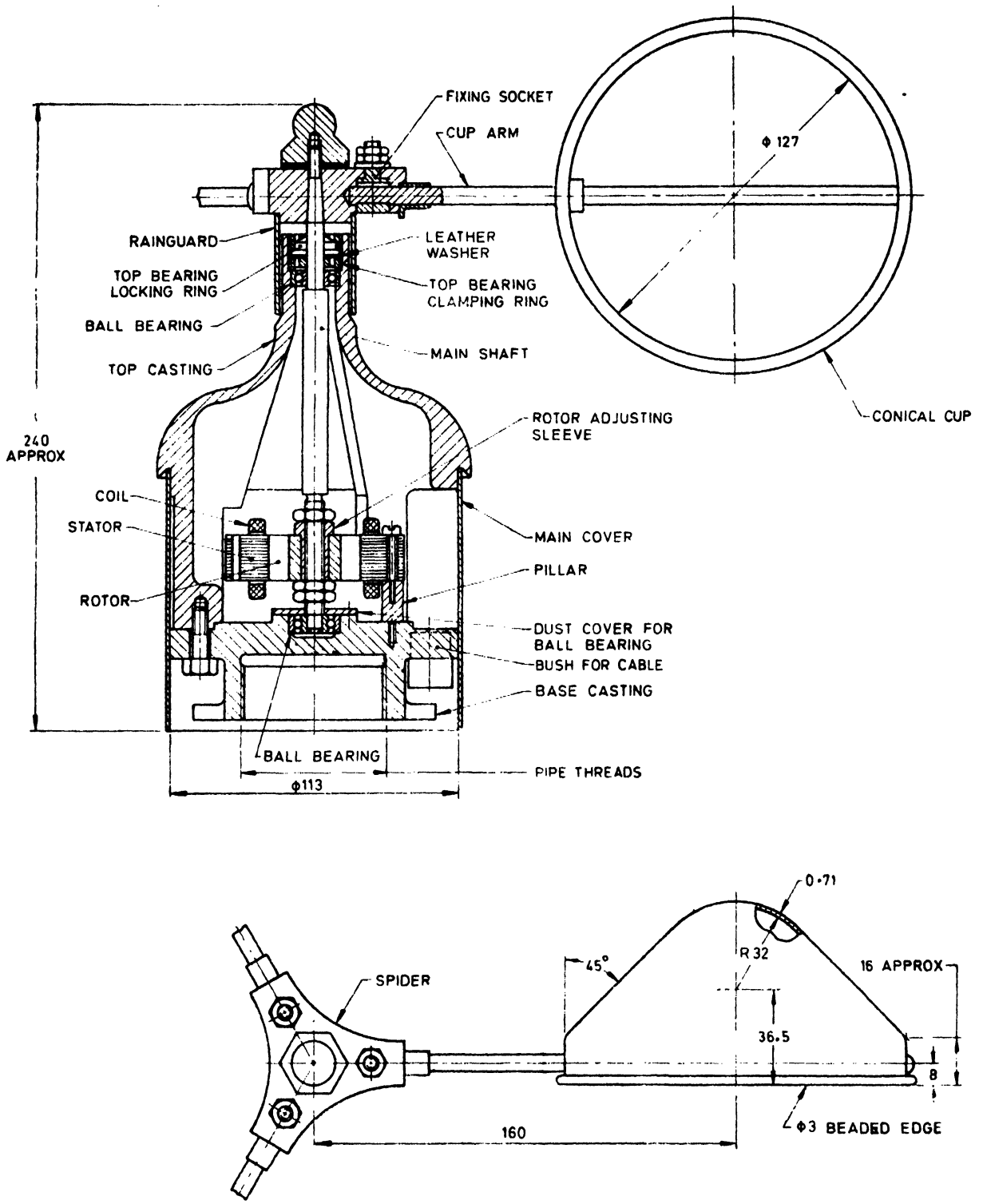
6.1.6 The terminal voltage of the generator shall be 10·000 ± 0·025 volts at 1 000 rev/min, when supplying a total of 5 mA to a circuit having negligible inductance at a temperature of 18 ± 2°C. The generator output at any lower speed shall not differ by more than 0·025 volts from the values specified below:

Speed of Rotation rev/min	*Output from Generator* volts
0	0
110	1
208	2
307	3
405	4
502	5
601	6
700	7
800	8
900	9
1 000	10

NOTE — The voltage shall be measured on a voltmeter having similar characteristics to the indicator, but calibrated in volts.

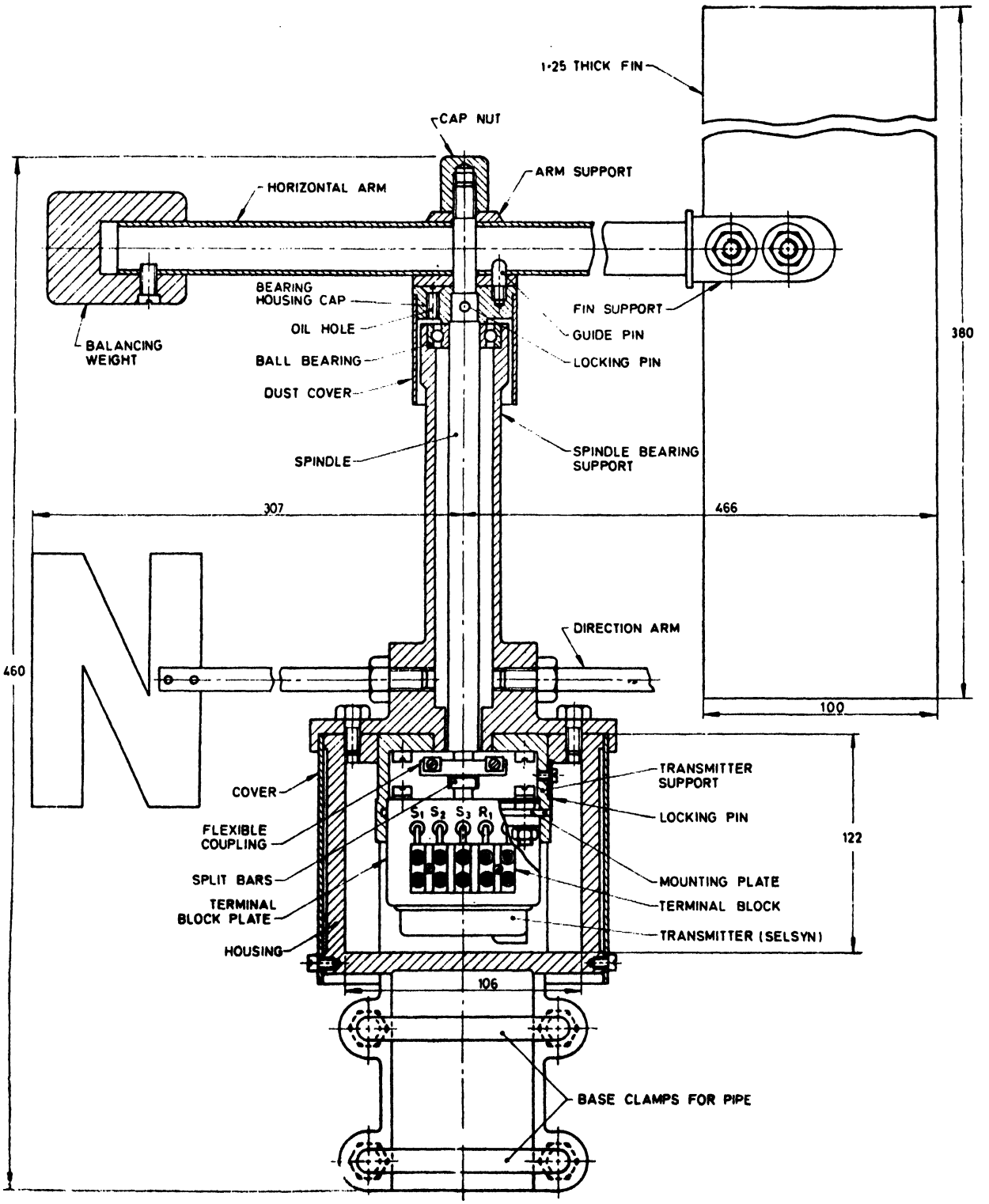
6.1.7 The electrical resistances of the generator and indicators shall be such that one two or three indicators may be used in parallel with one generator without affecting their accuracy of indication, provided the total resistance of each core of the cable between the generator and indicator does not exceed 10 ohms.

6.1.8 In order to allow the interchangeability between different generator and indicator units the design of cup rotor generator and indicator



All dimensions in millimetres.

FIG. 1 NOMENCLATURE AND DIMENSIONS FOR CUP GENERATOR ANEMOMETER



All dimensions in millimetres.

FIG. 2 NOMENCLATURE AND DIMENSIONS FOR ELECTRICAL WINDVANE

shall be so selected that the following relationship is obtained:

Speed of Rotation rev/min	*Wind Speed* knots	*Wind Speed* kmph
33	5	9
90	10	18
140	15	28
192	20	37
290	30	56
385	40	74
480	50	93
573	60	111
670	70	130
760	80	148
850	90	167
940	100	185

If the wind speed indication is in kmph, the following relationship shall be used:

Speed of Rotation rev/min	*Wind Speed* kmph
15	05
35	10
98	20
150	30
206	40
310	60
410	80
510	100
619	120
722	140
817	160
913	180
1 009	200

6.2 Windvane

6.2.1 The fin of the windvane shall be securely fixed at right angles to the horizontal arm at one end. The other end shall have a counterweight fixed in such a way that the complete assembly is well-balanced about the central spindle. The horizontal arm shall be straight and shall have no relative movement with respect to the spindle.

6.2.2 The dust cover shall have a locking pin projecting up, to lock it to the cone of the horizontal arm. The central hole in the dust cover shall take the spindle snugly without play. The dust cover shall be locked to the spindle by a steel pin.

6.2.3 The spindle bearing support shall hold the ball bearing tightly. It shall also have a hole at the base to serve as a bearing for the spindle. It shall also have four threaded holes near the base at right angles to its axis, for the four direction rods. Exactly below one of these holes, the letter 'N' shall be marked to facilitate proper orientation of the windvane. The spindle bearing support shall rest on and be securely fixed to the main housing. It shall hold the transmitter support at the bottom.

6.2.4 The housing for the transmitter shall be fixed to the base of the spindle bearing support. The lower portion of the housing shall be shaped in such a way that the entire windvane can be clamped to a 50-mm galvanized iron pipe firmly. The housing shall be provided with a hole at the base for the lead wires to come out through a bush.

6.2.5 The spindle shall hold tight the ball bearing at top and the split bars and flexible coupling at the bottom. The spindle shall be locked to the dust cover at top by means of a steel pin. The extreme top of the spindle shall take the cap nut.

6.2.6 The transmitter support shall be held below the spindle bearing support. A groove shall be cut inside for sliding in the transmitter with its mounting plate. The transmitter shall be held in position by a spring loaded locking pin.

6.2.7 The transmitter shall be of the dc synchronous type held on a mounting plate and the remote indication shall be as in Fig. 3. A terminal block plate shall be fixed to the mounting plate. A five-way terminal block shall be fixed on the terminal block plate and numbered 1, 2, 3, 4 and 5 lead wires to be connected to the terminal block.

6.2.8 One of the split bars shall hold the spindle while the other is attached to the transmitter shaft. The split bar holding the spindle shall be held inside the flexible coupling by two clips.

6.2.9 The flexible coupling shall be made of two brass channels soldered at right angles to each other. The lower channel shall have grooves cut in it to expose the screws fixing the transmitter shaft to the split bar. A steel pin shall be riveted at one end of the lower channel to serve as a stop for the split bar.

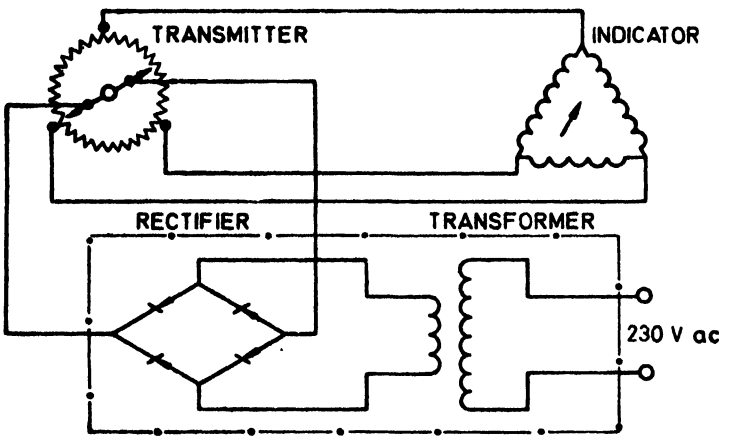


FIG. 3 DESYNN SYSTEM OF REMOTE INDICATION

6.2.10 The four direction rods shall be screwed into the threaded holes near the base of the spindle bearing support. The other ends of the rods carry the direction letters N, S, E and W. Each rod shall be provided with a locking nut.

6.2.11 The windvane shall be correctly aligned with the indicator such that the direction indicated by the vane agrees with that of the pointer of the indicator.

6.3 Wind Indicator Unit

6.3.1 The wind speed indicator shall be a voltmeter incorporating a rectifier and adjusted to take exactly 5 mA at 10 volts when supplied from 50 Hz ac mains, the wave form of which is approximately sinusoidal. It shall be calibrated to read in knots with either one scale having the full range 0 to 100 knots with a pointer movement of approximately 270° or two scales having ranges of 0 to 20 knots and 0 to 100 knots with a pointer movement of approximately 90°. Full range deflection in the two scales shall be 1·84 volts for the 0 to 20 knots scale and 9·4 volts for 0 to 100 knots scale with range selection being done by a spring loaded switch. Full range deflection for the single scale shall be for 9·4 volts. The electrical resistance of the indicator shall be such that one, two or three indicators may be used in parallel with one generator anemometer without affecting the accuracy of the indication. The indicator shall show the true speed when the total resistance of each core of the cable between the generator and the indicator does not exceed 10 ohms. The scale shall be so laid out that the readable value is not less than 1/2 knot.

6.3.2 The design of the speed indicator shall be such that it shall be possible to use any indicator with any generator to obtain the true wind speed within the limits of accuracy prescribed in this standard.

6.3.3 The wind direction indicator shall be a dc synchronous receiving motor operating on 24 volts dc supply obtained from a transformer rectifier or ac Selsyn motor operating on a secondary supply of 50/110 V from a transformer connected to 230 V ac mains. The dial shall be of the same size as that of the speed indicator and shall be graduated in degrees for every 5° position of the compass. The indicator shall be capable of denoting accurately the wind direction when connected to its tranmitter with a suitable cable, the resistance of each core being less than 50 ohms. The design shall be such that the accuracy of indication of direction shall be within the limits prescribed in this standard even when two indicators are connected in parallel to the same transmitter.

6.3.4 Both the front and rear panels of the cabinet shall be detachable. The front panel shall be designed to take in the speed and direction indicator dials, a pilot lamp and two spring loaded toggle switches. The rear panel shall be perforated for ventilation and shall hold a flush mounting two pin plug for the mains and a flush mounting octal socket for the sensors. The transformer shall be rated for a continuous current of 3A with secondary tappings for 24 V/50/100 V and 6 volts. The full wave rectifier shall have an output of 24 volts dc at 1A. In the case of magslip self synchronous transmitter, the cabiet shall contain a transformer which shall be

rated for a continuous current of 3A with secondary tappings for 6 V, 50 V or 110 V AC.

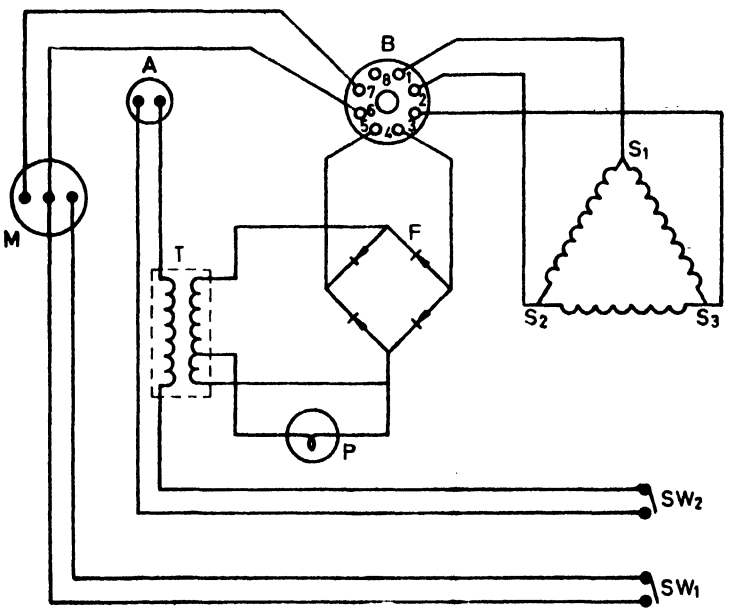
6.3.5 The cabinet shall be made to the smallest convenient size depending upon the dimensions of the various components used. The various electrical connections shall be firmly made with solder using PVC insulated wires of different colours. The exposed portions of the bare wires shall be adequately covered with fibre glass sleeving to avoid possibility of short circuiting anywhere.

6.3.6 The connections inside the wind indicator shall be as shown in Fig. 4 and 5.

7 WORKMANSHIP AND FINISH

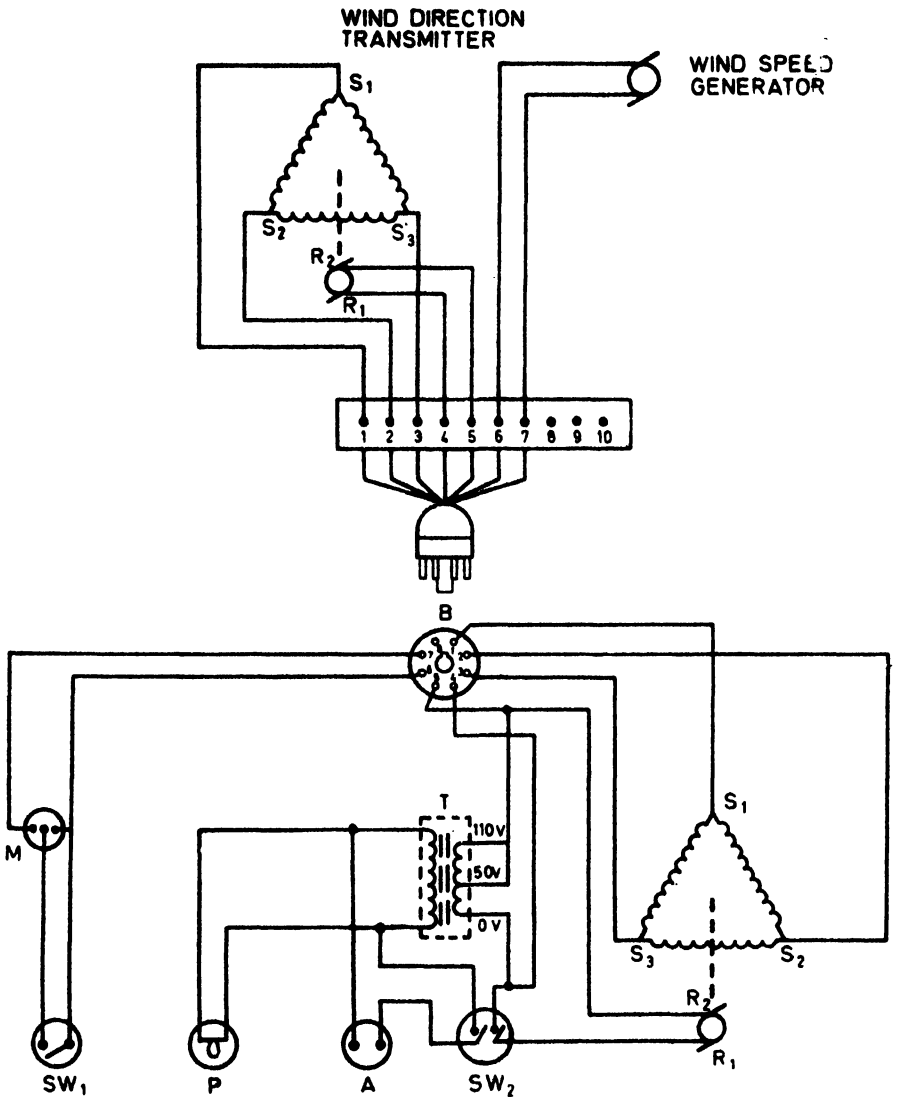
7.1 The workmanship of the anemometer shall be such that the cups start rotating at low wind speeds not exceeding 3 knots. The rotation of the cup assembly shall smooth and free from friction. The shaft shall be straight and sufficiently strong so as not to bend or get deformed even under extreme working conditions. The bearings of the generator shaft shall be adequately lubricated and protected from weather. The rotor shall not touch or foul the stator at any time. The external surfaces of the instrument shall be painted with undercoat and finishing paint. All rotating parts shall be well polished. The stator shall be coated with shellac.

7.2 The workmanship of the windvane shall be such that the vane moves with minimum friction and indicates changes in direction of the magnitude of 2°. As in the anemometer, all rotating parts in the windvane shall be well polished and the external surfaces painted with undercoat and finishing paint. The coupling between the spindle shaft and the transmitter shaft shall be rigid without any play. The split bars, flexible coupling and the mounting and terminal block plates shall have a dull plating of nickel. The figurings on the terminal block plate shall be filled with red paint, as also the letters 'N' marked on the bottom of the spindle bearing support. The direction letters N, S, E and W shall be painted red.



A	Flush mounting two pin plug for 230 V ac mains
B	Octal socket
F	Rectifier unit
M	Wind speed indicator
P	Pilot lamp
S_1, S_2, S_3	Stator terminals of wind direction indicator
SW_1	Range selector spring loaded switch for wind speed indicator
SW_2	Spring loaded switch for wind direction indicator
T	Step down transformer, 230 V to 24 V ac with 6 V tapping

FIG. 4 WIRING DIAGRAM OF WIND INDICATOR (DESYNN)



A	Two pin socket, flush mounting	S_1, S_2, S_3	Stator terminals of selsyn
B	Octal socket	SW_1	Range selecter toggle switch
M	Wind speed indicator	SW_2	Toggle switch
P	Pilot lamp	*T*	Step down transformer
R_1, R_2	Rotor terminals of selsyn		

FIG. 5 WIRING DIAGRAM OF WIND INDICATOR (SELSYN)

7.3 The wind indicator shall have a fine finish. The inscriptions on the front panel shall be engraved and filled in with paint easily distinguishable from the rest of the cabinet.

8 TESTS AND TOLERANCES

8.1 Cup Generator Anemometer

8.1.1 The rotating parts of the generator anemometer shall be accurately balanced and the cup arms shall be securely held in their sockets in the central spider casting at speeds up to 1 000 rev/min. The test for balancing of cups shall be carried out inside a room free from draughts before attaching the magnet to the shaft. While carrying out the test for balancing of the cups, with spindle held in horizontal position, the cups shall not show bias to any particular position.

8.1.2 To ensure sufficient freedom of the ball bearings the cups when set revolving at one revolution per second for 30 seconds in the direction they would normally rotate in wind, shall continue to be in motion for at least 90 seconds before coming to rest. This test shall also be conducted inside a room free from draughts and before the magnet is fixed to the shaft.

8.1.3 The anemometer shall be such that when connected to the indicator the indicated speed agrees with the true speed in a wind tunnel within the following limits:

True Speed	*Tolerance*
From 5 up to and including 20 knots	±0·5 knot
From 20 up to and including 60 knots	±1 knot
From 60 up to and including 100 knots	±1·5 knot

8.1.4 The cup rotor shall begin to revolve from rest in a wind speed not exceeding 3 knots.

8.2 Windvane

The rotating parts of the windvane shall be accurately balanced when tested in a room free from draughts.

8.3 Wind Indicator

8.3.1 The wind speed indicator shall give full scale deflection for 5 mA dc. The pointer shall move freely.

8.3.2 The wind direction indicator shall be so adjusted to its transmitter that the pointer indicates North (360°) when the balancing weight of the windvane points in the direction of the letter 'N' marked on the spindle bearing support of the windvane. The adjustment shall be correct to within ± 2°.

8.3.3 The indicator shall be capable of following all the minute oscillations of the windvane such that the indicated direction agrees with true direction with an accuracy of ± 2°.

9 MARKING AND PACKING

9.1 Marking

9.1.1 Each component of the equipment shall bear the following inscriptions engraved neatly and legibly at a prominent and convenient place:

a) Name of the component;
b) Serial number of the component; and
c) Indication of the source of manufacture.

9.2 Packing

9.2.1 The anemometer shall be dismantled before packing by detaching the three arms with cups and the component parts packed securely in a strong wooden case provided with separate compartment for the cup unit.

9.2.2 The windvane shall be dismantled before packing by detaching the fin from the horizontal arm and the component parts packed securely in a strong wooden case with fittings for the fin, horizontal arm, the main housing and the direction rods.

9.2.3 Each wind indicator cabinet shall be packed in a strong cardboard carton with sufficient cushioning all round to withstand ordinary transit risk.

9.2.4 Alternatively the various components may be packed as agreed to between the purchaser and the supplier.

10 TESTING AND INSPECTION

10.1 Each component of the equipment shall be tested individually for conformity to all the requirements of this specification.

Standard Mark

The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

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Revision of Indian Standards

Indian Standards are reviewed periodically and revised, when necessary and amendments, if any, are issued from time to time. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition. Comments on this Indian Standard may be sent to BIS giving the following reference:

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Amendments Issued Since Publication

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